EFFECTS OF FEED RATE AND BATT DENSITY ON OPERATION OF SAW-CYLINDER LINT CLEANERS

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EFFECTS OF FEED RATE AND BATT DENSITY ON OPERATION OF SAW-CYLINDER LINT CLEANERS

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SUMMARY

The experiments reported in this publication were conducted to ascertain the effects of lint feed rate and batt density on cleaning efficiency of saw-cylinder lint cleaners and on fiber quality. A second objective was to investigate the fibrous waste material removed by the lint cleaner.

Lint-cleaner feed rates studied averaged 11.4, 19.7, 23.0, 27.4, 39.2, and 56.2 pounds of lint per inch of saw-cylinder length per hour. Increasing the lint feed rate reduced the cleaning efficiency from 51.8 to 35.9 percent. These changes were also reflected in the classer's grade. Fiber array measurements showed no significant length differences attributed to feed rate.

It is indicated that lint fed to the cleaning machinery at high rates will result in decreased cleaning efficiency and perhaps produce lower bale values. Results of these experiments show that decreasing these feed rates will give highly significant increases in cleaning efficiency, higher grades, and some bale value increases, while causing no significant detrimental effect on fiber length, strength, or nep formation.

Densities used produced average batt weights of 13.5, 20.7, 27.3, 40.2, and 54.5 grams per square foot, and corresponding combing ratios were 10.3, 15.4, 20.6, 30.9, and 41.8. Lint-cleaner feed rates remained a constant 41.5 pounds of lint per inch of saw-cylinder length per hour.

No increase in cleaning efficiency was produced when decreasing the lint batt weight below 20.7 grams per square foot, while increasing the unit weight above 27.3 grams per square foot gave decreases in efficiency. Array measurements showed a highly significant length decrease attributed to the 54.5-gram-per-square-foot weight.

These data showed that lint fed to the lint-cleaning machinery at high batt densities and combing ratios will result in decreased cleaning efficiency and will likely produce lower bale values. These experiments show that the 40.2- and 54.5-gram-per-square-foot weights result in reduced cleaning efficiency and excessive fiber breakage. For efficient lint-cleaner operation and maximum return to the grower, the lint density corresponding to a batt weight of 20.7 grams per square foot at a combing ratio of 15.4 is recommended, with a practical limit of 27.3 grams per square foot at the combing ratio of 20.6.

PURPOSE AND SCOPE

Loading lint cleaners with cotton in the proper manner is one prerequisite to quality control during ginnery operation. In commercial gin plants this may be achieved by properly adjusting those factors related to loading. Two of these primary factors which could be controlled at the gin are lint feed rate and the cotton batt density. These factors were the subject of a 2-year investigation conducted at the U.S. Cotton Ginning Research Laboratory, Stoneville, Miss.

The primary objective of the loading experiments was to ascertain the effects of lint feed rate and batt density on cleaning efficiency of saw-cylinder lint cleaners, fiber-length distribution, nep count, and bale value. A second objective was to investigate the amount of fibrous waste material removed by the lint cleaner as a result of these treatments and to study the length distribution of this material.

GINNING EQUIPMENT

The seed cotton was dried, cleaned, and ginned in the laboratory's commercial-size gin plant. Ginning machinery sequence consisted of tower drier, six-cylinder cleaner, stick machine, tower dried, six-cylinder cleaner, extractor-feeder, gin stand and one stage of experimental lint clean-

ing. An electronic moisture meter served as an aid in adjusting driers for 7 percent fiber moisture at ginning.

Waste materials removed by the lint cleaner were weighed and tabulated for bale weight loss calculations. This material was collected on a condenser drum covered with a 100- by 100-mesh screen (fig. 1).

TEST PROCEDURE

Samples were obtained for (1) seed-cotton moisture and foreign-matter contents before and after seed-cotton cleaning, (2) lint-moisture level at ginning, (3) fiber maturity, (4) lint foreign-matter content, classer's grade and staple length, fiber-length distribution analyses, strength measurements, and nep count tests before and after lint cleaning, and (5) foreign-matter content and fiber length of lint-cleaner waste material.

The U.S. Department of Agriculture's Consumer and Marketing Service (now Agricultural Marketing Service) classed the samples at Greenwood, Miss., and made fiber tests at Clemson, S.C. Length measurements were determined from Suter-Webb arrays, and strength was determined by Pressley 1/8-inch gage tests.

FEED RATE EXPERIMENTS

Experimental Design

During the 1968 crop year, the hypotheses "decreasing the lint feed rate increased the cleaning efficiency," and "decreasing the lint feed rate shifts the fiber-length distribution of the cleaned lint toward the shorter fibers" were tested.

Seed cotton employed was 36 one-bale test lots, grown and machine-harvested by a local grower. Harvesting and gin processing were performed in six replications, approximately one replication per week. Harvesting covered a period from September 21 to October 25, giving good coverage of the conditions of cotton normally expected at the gin during a season.

Each replication consisted of six bales of similar cotton and involved three ginning rates and two lint feed rates per ginning rate (fig. 2). Ginning rates were set for 2.5, 4.5, and 6.5 bales per hour. Lint feed rates used per ginning rate were full rate, feeding all the cotton ginned to one lint cleaner (A); and one-half rate, dividing the ginned lint and feeding half of it to lint cleaner (A)

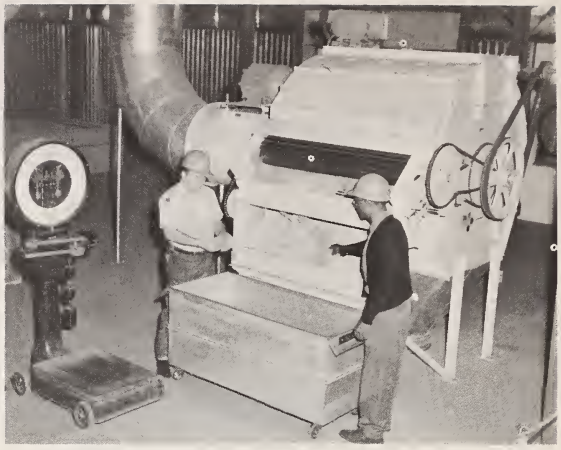

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FIGURE 1.—Collecting lint-cleaner waste material for weighing and sampling.

and half to a second similar lint cleaner (B) in a single-stage split-stream arrangement. Lint-cleaner element speeds were the same for the full-rate and half-rate feeding.

Saw cylinders on the lint cleaners used in these experiments were 16 inches in diameter and rotated at 1,110 r/min. (4,650 ft/min saw-tip speed). The cleaner operated at a combing ratio[1] of 23.6 to 1 and employed six grid-bars. The manufacturer's saw spacing provided 32 teeth per square inch of saw-cylinder surface.

Feed Rate Control

Actual ginning rates obtained very closely approximated the three desired ginning rates (table 1).[2] Six lint-cleaner feed rates were obtained as a result of the combination of three

[1] Combing ratio is defined as a ratio of the tip speed (feet per minute) of the combing saw to the rim speed (feet per minute) of the feed roller.

[2] The tables are located in the appendix.

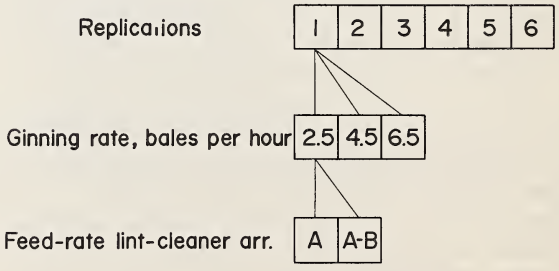

FIGURE 2.—Experimental feed-rate test layout.

ginning rates and two lint-cleaner arrangements. Lint-cleaner feed rates averaged 11.4, 19.7, 23.0, 27.4, 39.2, and 56.2 pounds of lint per inch of saw-cylinder length per hour. The corresponding amounts of lint fed per square foot of rotating saw-cylinder surface were 0.00049, 0.00085, 0.00099, 0.00118, 0.00169, and 0.00242 pounds.

Seed-Cotton Data

Oven-moisture determinations of wagon samples of the seed cotton showed that moisture levels averaged 13.7 percent (table 2). Corresponding moisture contents after passage through the seed-cotton drying and cleaning machinery averaged 11.1 percent (table 2). Fractionation tests showed an average wagon seed-cotton foreign-matter content of 8.5 percent, which was reduced to 2.2 percent at the feeder apron.

Ginned Lint Data

Moisture content

Lint-moisture samples taken between the gin stand and lint cleaner showed this moisture level to average 6.2, 7.4, 6.1, 6.5, 6.1, and 6.3 percent, respectively, for replications 1, 2, 3, 4, 5, and 6. Test lots in each replication were assigned to treatments in a random fashion, resulting in no significant differences in the lint-moisture content of cotton processed with the gin rate or lint-cleaner feed-rate treatments (table 3).

Foreign-matter content

Lint foreign-matter content (determined by the Shirley Analyzer method) for the study averaged 7.71 percent before lint cleaning and 4.25 percent after one stage of saw-cylinder lint cleaning (table 3). Of the two lint-cleaning arrangements used, the arrangement giving the lower lint feed rate produced the lower foreign-matter content and this was highly significant statistically.

Cleaning efficiency

Foreign-matter content before and after cleaning showed that the cleaning efficiency (percent of total foreign matter removed) averaged 44.8 percent for the study (table 3). Increasing the lint feed rate from 11.4 to 56.2 pounds of lint per inch of saw-cylinder length per hour decreased the cleaning efficiency from 51.8 to 35.9 percent. These data produced the regression line $Y=54.93-0.34X$ with correlation coefficient (r) equal to -0.99; where $Y=$ lint cleaning efficiency in percent, and $X=$lint feed rate in pounds of lint per inch of saw-cylinder length per hour (fig. 3).

Increases in cleaning efficiency obtained by split-stream feeding of the lint cleaners to half the feed rate were found to be highly significant. Thus, the hypothesis "decreasing the lint feed rate increases the cleaning efficiency" was found to be true for the cottons and lint-cleaner arrangements used.

Classer's grade

The one stage of lint cleaning increased the average grade from Good Ordinary to Low Middling Light Spotted (table 4). A considerable number of bales were classed as Light Spotted (ls), and this color factor limited the amount of grade improvement which could be obtained as a result of a lint-cleaner treatment.

Decreasing the lint-cleaner feed rate increased the grade index of the cleaned lint. The grade index obtained employing the one-half feed rate (A-B) arrangement was significantly higher (10-percent level) than the grade index obtained with the full rate feed (A) arrangement.

Classer's staple length

Small but highly significant decreases in staple length were attributed to increases in lint feed rate. The half-rate (A-B) and the full rate (A) of feed treatments gave average staple lengths of 34.79 and 34.59 thirty-seconds of an inch, respectively (table 4).

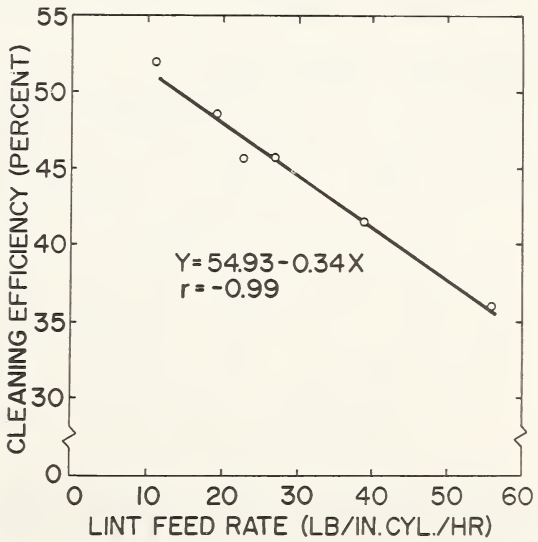

FIGURE 3.—Effect of lint-cleaner feed rate on cleaning efficiency.

Bale weight

The single stage of lint cleaning reduced the average bale gross weight from 500 pounds before to 478.1 pounds after cleaning (table 5). Increasing the feed rate from 11.4 to 56.2 pounds of lint per inch of saw-cylinder length per hour increased the bale gross weight from 473.2 to 482.0 pounds. Bale weight differences between the half and full feed-rate lint-cleaner arrangements were highly significant.

Bale value

Bale values for the study were determined from cotton grade, staple length and bale weight and were based on the 1968 loan price. The loan price used was 20.65 cents per pound for Middling grade and 1-inch staple length (appendix table 23).

Average bale values for no cleaning and one stage of lint cleaning were $71.34 and $81.77 (table 5). The lint-cleaner arrangement employing the half feed rate gave bale values averaging $2.81 higher than the arrangement employing the full feed rate. However, these bale value increases attributed to lint-cleaner arrangement were not significant statistically.

Fiber-maturity and fineness

Fiber testing of samples taken from ginned lint indicated the cotton to be of normal maturity (table 6). Causticaire fineness for replications 1, 2, 3, 4, 5, and 6 averaged 4.9, 5.0, 4.8, 4.6, 4.8, and 4.8 micrograms per inch, respectively. Corresponding micronaire readings were 4.6, 4.7, 4.5, 4.3, 4.6, and 4.6.

Fiber-length distribution

Before lint cleaning, upper quartile length, mean length, and coefficient of variation for the cotton averaged 1.27 inches, 1.05 inches, and 28.8 percent, respectively (table 7). Percentage of fibers longer than 1 inch, from ½ to 1 inch, and shorter than one-half inch averaged 68.0, 23.6, and 7.8 (table 8).

After lint cleaning, upper quartile length, mean length, and coefficient of variation averaged 1.25 inches, 1.01 inches, and 31.8 percent (table 7). Percentage of fibers longer than 1 inch, from ½ to 1 inch and shorter than one-half inch averaged 61.2, 28.2, and 10.0 (table 8).

Length differences when attributed to lint-cleaner arrangement were not significant statistically for any of the array measurements. The hypothesis "decreasing the lint feed rate shifts the fiber length distribution of the cleaned lint toward the shorter fibers" was found to be false.

Strength index

No significant differences in fiber strength were attributed to lint-cleaner feed rate (table 9). Fiber strength averaged 22.93 and 22.96 grams per tex for the high and low feed-rate lint-cleaner arrangements.

Nep count

Lint cleaning increased the neps per 100 square inches of web from 10.3 before cleaning to 20.8 after one stage of saw-cylinder cleaning (table 9).

The lint-cleaner arrangement giving the full feed rate produced lint with an average of 20.0 neps per 100 square inches of web, while the half feed-rate lint-cleaner arrangement produced an average nep count of 21.6 neps. These nep count differences were found to be not statistically significant.

Waste Material

Weight per bale

Waste material extracted by the one stage of lint cleaning averaged 22 pounds per bale (table 10). Increasing the lint feed rate from 11.4 to 56.2 pounds of lint per inch of saw-cylinder length per hour decreased the amount of waste removed from the bale from 26.7 to 18.1 pounds. When attributed to lint-cleaner arrangement, differences in waste weight were highly significant.

These data described the logarithmic expression $\log Y = 1.700 - 0.256 \log X$, where Y = amount of waste extracted, and X = lint-cleaner feed rate. Correlation coefficient (r) for the expression was −0.96, which was significant at the 1-percent level (fig. 4).

Foreign-matter content

Foreign-matter content of the lint-cleaner waste (determined by the Shirley Analyzer method) averaged 71.24 percent for all treatments (table 10). Percentage of foreign matter ranged from 66.72 to 73.48 percent when the feed rate to the cleaner increased from 11.4 to 56.2 pounds of lint per inch of saw-cylinder length per hour. Differences in foreign-matter content were significant at the 1-percent level when attributed to lint-cleaner arrangement.

These data were fitted to the curvilinear re-

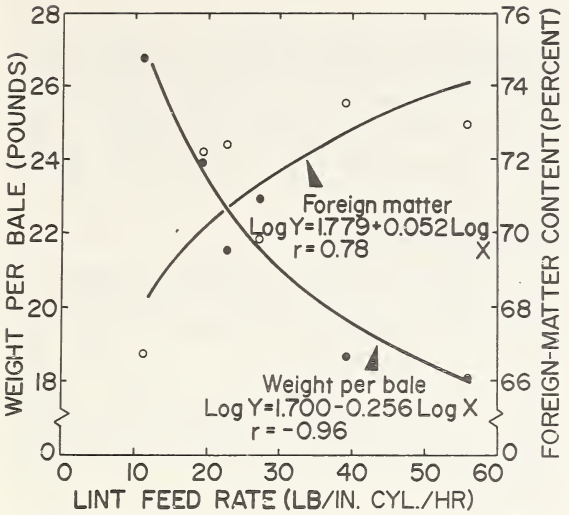

FIGURE 4.—Effect of lint feed rate on amount of waste material extracted by the lint cleaner, and the foreign-matter content of this material.

gression equation relating foreign-matter content to lint-cleaner feed rate: Log Y=1.779+ 0.052 Log X, where Y=foreign-matter content, and X=lint-cleaner feed rate. Correlation coefficient for the equation was —0.78 (fig. 4).

The data indicate that as the feed rate decreased lint was removed at a faster rate than the foreign matter, producing a net decrease in the foreign-matter content of the waste material.

Fiber-length distribution

Waste material extracted by the one stage of lint cleaning contained fiber whose upper quartile length, mean length and coefficient of variation averaged 1.24 inches, 0.99 inch, and 33.8 percent (table 11). Percentage fibers longer than 1 inch, from ½ to 1 inch, and shorter than one-half inch for this material averaged 58.4, 29.3, and 11.7.

Lint-cleaner waste length differences attributed to lint-cleaner arrangement were small and not significant.

Statistical Analysis

The study was analyzed statistically as a factorial experiment involving six replications of three ginning rates and two lint-cleaner arrangements. The analysis of variance was calculated with the following distribution of degrees of freedom:

Source	Degrees of freedom
Replication	5
Ginning rate	2
Lint-cleaning arrangement	1
Ginning rate times lint-cleaner arrangement	2
Error	25

These data, with the resulting significance levels, are shown in appendix tables 24, 25, and 26. No significant interaction between ginning rate and lint-cleaner arrangement was found for any of the properties studied. It should be noted that ginning-rate effects as shown would be contributed to by the combination of changing the rate of seed cotton fed (1) through the extractor-feeder and (2) to the ginning saws.

BATT DENSITY EXPERIMENTS

Experimental Design

During the 1970 crop year, the hypothesis "decreasing the lint batt density at constant feed rate increases the cleaning efficiency but shifts the fiber-length distribution of the clean lint toward the shorter fibers" was tested.

Twenty-five 1-bale test lots, grown and machine-harvested by the Mississippi Delta Branch Experiment Station and a local grower, were used in the study. Harvesting and gin processing were performed in five replications and covered the period from September 29 to November 6.

Each replication consisted of five bales of similar cotton and involved five batt densities at the lint cleaner (fig. 5). Ginning rate was set for a constant 5½ bales per hour and variations in batt density were obtained by adjusting the rim speeds of the lint-cleaner condenser drum, doffing rollers, and feed rollers. As a necessary consequence of lint-cleaner design, changes in batt density (under a constant flow rate) will result from changes in the combing ratio.

The 1970 experimental lint cleaner used a 14-inch-diameter saw cylinder which rotated at 1,035 r/min (2,845 ft/min saw-tip speed). Saw

FIGURE 5.—Experimental batt-density test layout.

spacing provided 48 teeth per square inch of saw-cylinder surface, and the cleaner contained five grid-bars.

Batt Density Control

Ginning was controlled at a constant rate and produced an average feed rate of 41.5 pounds of lint per inch of saw-cylinder length per hour. This furnished to the saw cylinder 0.00292 pounds of lint per square foot of its rotating surface. Lint-cleaner shaft speeds were set for combing ratios of 10.3, 15.4, 20.6, 30.9, and 41.8. These produced batts of increasing density at the feed plate corresponding to weights of 13.5, 20.7, 27.3, 40.2, and 54.5 grams per square foot of batt area (table 12). The thinnest batt (13.5 grams per square foot) was fed as tufts and was non-continuous. The other batts were fed in continuous form. Mechanical difficulty occurred in feeding the heaviest batt (54.5 grams per square foot) on two of the replications.

Seed-Cotton Data

Oven-drying determinations on seed cotton sampled from the wagon showed that this moisture level averaged 10.2 percent (table 13). Corresponding moisture contents at the feeder apron, after passage through the seed-cotton drying and cleaning machinery, averaged 9.2 percent. Fractionation tests produced an average wagon seed-cotton foreign-matter content of 6.1 percent, which was reduced to 2.0 percent at the feeder apron.

Ginned Lint Data

Moisture content

Lint sampled after ginning but before lint cleaning showed moisture level averages of 5.7, 6.8, 7.7, 6.9, and 6.0 percent, respectively, for replications 1, 2, 3, 4, and 5. Test lots in each replication were assigned to treatments in a random fashion, resulting in no significant differences in the lint-moisture content of cotton processed with different lint-cleaner batt density treatments (table 14).

Foreign-matter content

Lint foreign-matter content for the study averaged 6.29 percent before lint cleaning and 4.14 percent after one stage of saw-cylinder lint cleaning (table 14). Although the two higher batt densities appeared to produce higher foreign-matter contents than the lower densities, these increases when attributed to lint-cleaner treatment were found to be not significant statistically. The lowest foreign-matter content was obtained when employing the density corresponding to a weight of 27.3 grams per square foot.

Cleaning efficiency

Lint-cleaner efficiency (percent of total foreign matter removed) varied from 28.7 to 36.8 percent and averaged 34.1 percent (table 14). Decreases in efficiency were obtained at the higher densities (and combing ratios) employing 40.2 and 54.5 grams per square foot; however, these differences were not statistically significant.

Classer's grade

The single stage of lint cleaning increased the average grade from Good Ordinary plus to Strict Good Ordinary plus (table 15). Grade index figures for the lower batt densities were slightly higher than those for the higher densities, but these differences were not significant statistically.

Classer's staple length

No significant change in staple length was attributed to change in lint batt density. The five lint-cleaner treatments gave average staple lengths of 34 to 34.2 thirty-seconds of an inch (table 15).

Bale weight

The single stage of lint cleaning reduced the average bale gross weight from 500 pounds before to 485.3 pounds after cleaning (table 16). Bale weight differences among the five lint-cleaner batt density treatments were not significant. Average treatment bale weight varied from 484.4 to 486.3 pounds.

Bale value

Bale values for the study were determined from cotton grade, staple length and bale weight and were based on the 1970 loan price. The loan price used was 20.50 cents per pound for Middling grade and 1-inch staple length (appendix table 27).

Average bale values for no cleaning and one stage of lint cleaning were $78.48 and $88.66 (table 16). The highest lint-cleaner batt density used, 54.5 grams per square foot, produced the lowest bale value. However, average bale values

among all lint-cleaner treatments differed by only $2.45, and these differences were not significant statistically.

Fiber maturity and fineness

Fiber testing of samples taken from ginned lint indicated the cotton to be of normal maturity (table 17). Causticaire fineness for replications 1, 2, 3, 4, and 5 averaged 5.0, 5.1, 5.1, 5.0, and 5.1 micrograms per inch, respectively. Corresponding micronaire readings were 4.7, 4.8, 4.7, 4.6, and 4.7.

Fiber-length distribution

Before lint cleaning, upper quartile length, mean length and coefficient of variation for all cotton averaged 1.25 inches, 1.02 inches and 30.4 percent, respectively (table 18). Percentage of fibers longer than 1 inch, from ½ to 1 inch, and shorter than one-half inch averaged 63.2, 27.3, and 9.1 (table 19).

After lint cleaning, the three lower-density treatments (13.5, 20.7, and 27.3 grams per square foot) did not suffer damage to the upper quartile length (table 18). Lint cleaned at batt weights of 40.2 and 54.5 grams per square foot were shortened by 0.01 and 0.03 inches, respectively.

Further evidence of fiber shortening—due to breakage—may be found in the major length groups data. Fibers longer than 1 inch decreased but slightly for batt densities up to weights of 27.3 grams per square foot (table 19); breakage was more serious at densities corresponding to lint weights of 40.2 and 54.5 grams per square foot. These findings are reinforced by the changes in "fibers ½ to 1 inch" and "fibers shorter than one-half inch."

The hypothesis "decreasing the lint batt density at constant feed rate increases the cleaning efficiency but shifts the fiber-length distribution of the clean lint toward the shorter fibers" was found to be false.

Strength index

Fiber strength averaged 22.44 grams per tex before lint cleaning compared to 22.20 grams per tex after the one stage of experimental cleaning (table 20). The batt density obtained from the 40.2-gram-per-square-foot weight produced slightly but significantly higher-strength cotton than the two lower densities. This is attributed in part to the somewhat higher strength of the cotton processed with the higher density batts.

Nep count

Lint cleaning increased the neps per 100 square inches of web from 16.8 before cleaning to 19.9 after one stage of saw-cylinder cleaning (table 20).

The lint-cleaner treatment using the lowest batt density produced lint with an average of 18.3 neps per 100 square inches of web while the highest batt density lint-cleaner treatment produced an average nep count of 20.2 neps. Nep count differences attributed to batt density and combing ratio were found to be not statistically significant.

Waste Material

Weight per bale

Waste material extracted by the one stage of lint cleaning averaged 14.7 pounds per bale (table 21). Although a slightly greater amount of waste was removed at the highest batt density, weight differences among all treatments were small and not significant.

Foreign-matter content

The foreign-matter content of the lint-cleaner waste (determined by the Shirley Analyzer method) averaged 71.28 percent (table 21). When attributed to batt density and combing ratio, differences in the foreign-matter content of the waste were significant at the 1-percent level. Increasing the batt density to a weight of 27.3 grams per square foot raised the waste foreign-matter content to 76.48 percent, but further batt weight increase to 40.2 and 54.5 grams per square foot lowered the foreign-matter content to 71.87 and 62.37 percent, respectively.

This indicates that at the higher densities lint is removed faster than foreign matter, producing a net decrease in the foreign-matter content of the waste material.

Fiber-length distribution

Lint-cleaner waste length differences attributed to lint-cleaner batt density were small and not significant. Waste material removed by the one stage of lint cleaning contained fiber whose upper quartile length, mean length and coefficient of variation averaged 1.19 inches, 0.91 inch, and 38.8 percent (table 22). Percentage of fibers longer than 1 inch, from ½ to 1 inch, and shorter than one-half inch for this material averaged 48.8, 33.2, and 17.4.

Statistical Analysis

The study was analyzed statistically as a randomized complete-block experiment involving five replications of five lint-cleaner batt densities. The analysis of variance was calculated with the following distribution of degrees of freedom:

Source	*Degrees of freedom*
Replications	4
Lint-cleaner batt density	4
Error	16

These data, with the resulting significance levels, are shown in appendix table 28. Significant differences at the 1-percent and 5-percent levels for individual treatments were determined by Tukey's w-procedure and are shown in appendix table 29.

Only one of the lint-cleaner waste properties studied was found to be significantly affected by batt density. Foreign-matter content became greater as the lint-cleaner batt weight was increased from 13.5 to 27.3 grams per square foot, but then decreased when the weight was further increased to 54.5 grams per square foot, with both changes significant at the 1-percent level.

Although this report is primarily concerned with lint-cleaner batt density, it should be noted that treatment effects as shown would be contributed to by a combination of changing (1) combing ratio and (2) batt density.

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Results of related investigations are given in the following publications.

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APPENDIX

TABLE 1.—*Lint feed rates resulting from six combinations of ginning rate and lint-cleaner arrangement*

Lint-cleaner arrangement[1]	Desired ginning rate, bales/hr	Actual ginning rate, bales/hr	Lint-cleaner feed rate	
			lb/in saw-cyl./hr	lb × 10 − 3/ft² saw-cyl.
A	2.50	2.68	23.0	0.99
A-B	2.50	2.66	11.4	.49
A	4.50	4.55	39.2	1.69
A-B	4.50	4.58	19.7	.85
A	6.50	6.53	56.2	2.42
A-B	6.50	6.38	27.4	1.18

[1] A—All cotton from the gin stand passed through 1 lint cleaner; A-B—Cotton from the gin stand was divided so that half of it passed through each of 2 lint cleaners in parallel.

TABLE 2.—*Moisture and foreign-matter contents of seed cotton processed for experimental saw-cylinder lint cleanings, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Moisture content, %		Foreign-matter content, %	
Arrangement	Feed rate, lb/in saw-cyl./hr		Wagon	Feeder apron	Wagon	Feeder apron
A	23.0	2.68	14.7	11.2	8.1	2.1
A-B	11.4	2.66	14.1	11.4	8.8	2.2
A	39.2	4.55	13.3	10.6	8.1	2.1
A-B	19.7	4.58	13.6	11.1	8.2	2.4
A	56.2	6.53	13.4	11.3	9.6	2.3
A-B	27.4	6.38	12.8	10.9	8.3	2.2
Average			13.7	11.1	8.5	2.2

[1] Each treatment was replicated 6 times. Data represent average findings for samples tested before each replication.

TABLE 3.—*Fiber moisture, lint foreign matter, and cleaning efficiency data for experimental saw-cylinder lint cleanings, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Fiber-moisture content at ginning, %	Lint foreign-matter content, %		Lint-cleaner efficiency,[2] %
Arrangement	Feed rate, lb/in saw-cyl./hr			Before lint cleaning	After lint cleaning	
A	23.0	2.68	6.6	7.34	3.98	45.5
A-B	11.4	2.66	6.4	7.28	3.53	51.8
A	39.2	4.55	6.4	7.48	4.34	41.5
A-B	19.7	4.58	6.5	8.03	4.11	48.5
A	56.2	6.53	6.4	8.25	5.26	35.9
A-B	27.4	6.38	6.2	7.90	4.27	45.7
Average			6.4	7.71	4.25	44.8

[1] Each treatment was replicated 6 times. Differences between lint-cleaner arrangements are not significant for fiber-moisture content, and are significant at the 1% level for foreign-matter content of cleaned lint and for lint-cleaner efficiency.

[2] The cleaning efficiency of a lint cleaner is the ratio of foreign matter removed from the cotton to the foreign-matter content of the cotton as it entered the lint cleaner, expressed as a percentage.

TABLE 4.—*Classer's grade index and designation and staple length of ginned lint samples before and after one stage of experimental saw-cylinder lint cleanings, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Grade index[2]		Grade designation		Staple length, 1/32-in	
Arrangement	Feed rate, lb/in saw-cyl./hr		Before cleaning	After cleaning	Before cleaning	After cleaning	Before cleaning	After cleaning
A	23.0	2.68	68.3	79.3	GO	LM1s	34.50	34.83
A-B	11.4	2.66	71.7	81.5	GO+	SGO+	34.58	34.93
A	39.2	4.55	71.7	78.8	GO+	LM1s	34.33	34.60
A-B	19.7	4.58	68.3	81.3	GO	SGO+	34.42	34.87
A	56.2	6.53	61.7	76.7	BG	SGO	34.17	34.33
A-B	27.4	6.38	66.7	80.3	GO	LM1s	34.25	34.57
Average			68.1	79.7	GO	LM1s	34.38	34.69

[1] Each treatment was replicated 6 times. Data represent average findings for samples tested before and after each replication. For cleaned lint, differences between lint-cleaner arrangements are significant at the 10% level for grade index and at the 1% level for staple length.

[2] Grade designation and corresponding grade index: LM=85; SGO+=81; SGO=76; GO+=73; GO=70; BG=60; LM1s=80.

TABLE 5.—*Weight and value per bale of ginned lint for experimental saw-cylinder lint cleanings, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Weight of bale, lb	Value of bale	
Arrangement	Feed rate, lb/in saw-cyl./hr			Before lint cleaning	After lint cleaning
A	23.0	2.68	478.5	$71.67	$82.43
A-B	11.4	2.66	473.2	75.00	83.94
A	39.2	4.55	481.5	74.96	81.17
A-B	19.7	4.58	476.2	71.58	83.76
A	56.2	6.53	482.0	64.79	77.48
A-B	27.4	6.38	477.3	70.04	81.81
Average			478.1	71.34	81.77

[1] Weights were measured after lint cleanings and include the weight of bagging and ties; value per bale was calculated from Commodity Credit Corporation loan rates shown in appendix table 23.

Each treatment was replicated 6 times. For cleaned lint, differences between lint-cleaner arrangements are significant at the 1% level for weight per bale and are not significant for value per bale.

TABLE 6.—*Fiber maturity data for lint processed before experimental lint cleanings, crop of 1968*

Replication[1]	Causticaire		Micronaire reading
	Maturity index, %	Fineness, μg/in	
1	79	4.9	4.6
2	79	5.0	4.7
3	78	4.8	4.5
4	77	4.6	4.3
5	79	4.8	4.6
6	78	4.8	4.6
Average	78	4.8	4.6

[1] Data for each replication represent average findings from the 6 treatments.

TABLE 7.—*Upper quartile length, mean length, and coefficient of length variation before and after one stage of experimental saw-cylinder lint cleanings, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Upper quartile length, inches		Mean length, inches		Coefficient of variation, %	
Arrangement	Feed rate, lb/in saw-cyl./hr		Before cleaning	After cleaning	Before cleaning	After cleaning	Before cleaning	After cleaning
A	23.0	2.68	1.27	1.24	1.05	1.01	29.2	31.0
A-B	11.4	2.66	1.27	1.25	1.05	1.02	29.2	31.2
A	39.2	4.55	1.27	1.25	1.05	1.01	29.0	31.7
A-B	19.7	4.58	1.27	1.25	1.05	1.01	28.5	32.1
A	56.2	6.53	1.27	1.24	1.06	1.00	28.7	32.4
A-B	27.4	6.38	1.27	1.25	1.06	1.01	28.2	32.4

[1] Each treatment was replicated 6 times. For cleaned lint, differences between lint-cleaner arrangements are not significant for upper quartile length, mean length, or coefficient of variation.

TABLE 8.—*Fiber-length distribution for lint samples before and after one stage of saw-cylinder lint cleaning, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Fibers longer than 1 inch, %		Fibers 1/2 to 1 inch, %		Fibers shorter than 1/2 inch, %	
Arrangement	Feed rate, lb/in saw-cyl./hr		Before cleaning	After cleaning	Before cleaning	After cleaning	Before cleaning	After cleaning
A	23.0	2.68	67.4	62.2	24.0	27.7	8.2	9.6
A-B	11.4	2.66	69.0	62.7	22.7	27.0	7.7	9.7
A	39.2	4.55	66.9	62.1	24.3	27.4	8.3	9.9
A-B	19.7	4.58	67.8	60.7	23.7	28.7	7.9	10.1
A	56.2	6.53	68.9	59.1	23.0	29.7	7.6	10.6
A-B	27.4	6.38	68.1	60.4	24.2	28.6	7.1	10.3

[1] Each treatment was replicated 6 times. For cleaned lint, differences between lint-cleaner arrangements are not significant for any of the length groupings.

TABLE 9.—*Fiber strength and nep count for lint samples before and after one stage of experimental saw-cylinder lint cleaning, replicated six times, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Fiber strength g/tex[2]		Nep count, per 100 in^2 of web	
Arrangement	Feed rate, lb/in saw-cyl./hr		Before Cleaning	After cleaning	Before cleaning	After cleaning
A	23.0	2.68	22.60	22.78	11.8	21.3
A-B	11.4	2.66	22.65	23.01	11.0	21.4
A	39.2	4.55	22.68	23.10	10.0	19.3
A-B	19.7	4.58	22.88	23.12	10.0	23.6
A	56.2	6.53	22.88	22.92	9.8	19.3
A-B	27.4	6.38	22.60	22.76	9.3	19.9

[1] For cleaned lint, differences between lint-cleaner arrangements are not significant for fiber strength or nep count.
[2] Strength was determined by 1/8-inch gage tests using the Pressley strength tester.

TABLE 10.—*Weight and foreign-matter content of waste material extracted by one stage of experimental saw-cylinder lint cleaning, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Weight extracted per bale,[2] lb	Foreign-matter content, %
Arrangement	Feed rate, lb/in saw-cyl./hr			
A	23.0	2.68	21.5	72.37
A-B	11.4	2.66	26.7	66.72
A	39.2	4.55	18.6	73.48
A-B	19.7	4.58	23.9	72.15
A	56.2	6.53	18.1	72.93
A-B	27.4	6.34	22.9	69.79
Average			22.0	71.24

[1] Each treatment was replicated 6 times. Differences between lint-cleaner arrangements are significant at the 1% level for weight extracted per bale and foreign-matter content.
[2] Weight of waste is based on 478 lbs of ginned lint packaged when using no lint cleaning.

TABLE 11.—*Fiber-length distribution of waste material extracted by one stage of experimental saw-cylinder lint cleaning, crop of 1968*[1]

Lint cleaner		Ginning rate, bales/hr	Upper quartile length, inches	Mean length, inches	Coefficient of variation, %	Fibers longer than 1 inch, %	Fibers 1/2 to 1 inch, %	Fibers shorter than 1/2 inch, %
Arrangement	Feed rate, lb/in saw-cyl./hr							
A	23.0	2.68	1.25	1.00	33.1	60.6	27.7	11.1
A-B	11.4	2.66	1.24	.97	36.0	56.6	29.2	13.6
A	39.2	4.55	1.26	1.02	32.2	61.7	27.6	10.1
A-B	19.7	4.58	1.24	.99	33.3	58.3	29.5	11.7
A	56.2	6.53	1.22	.97	34.7	55.4	31.4	12.6
A-B	27.4	6.38	1.24	.99	33.6	57.5	30.5	11.4

[1] Each treatment was replicated 6 times. Differences between lint-cleaner arrangements are not significant for any of the fiber length categories.

TABLE 12.—*Lint weights resulting from changing combing ratio and batt density at constant ginning rate*

Treatment	Combing ratio[1]	Desired		Actual	
		Ginning rate, bales/hr	Lint-cleaner batt weight, g/ft²	Ginning rate, bales/hr	Lint-cleaner batt weight, g/ft²
1	10.3	5.5	13.8	5.38	13.5
2	15.4	5.5	20.7	5.49	20.7
3	20.6	5.5	27.6	5.44	27.3
4	30.9	5.5	41.4	5.34	40.2
5	41.8	5.5	55.2	5.43	54.5

[1] Combing ratio is defined as a ratio of the tip speed (feet per minute) of the combing saw to the rim speed (feet per minute) of the splined feed roller.

TABLE 13.—*Moisture and foreign-matter contents of seed cotton processed before experimental lint cleanings, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Moisture content, %		Foreign-matter content, %	
Density	Weight, g/ft²		Wagon	Feeder apron	Wagon	Feeder apron
1	13.5	10.3	10.5	9.2	5.7	2.0
2	20.7	15.4	10.1	9.1	6.1	1.8
3	27.3	20.6	10.9	9.3	6.8	2.2
4	40.2	30.9	10.0	9.0	5.7	1.9
5	54.5	41.8	9.7	9.3	6.2	2.0
Average			10.2	9.2	6.1	2.0

[1] Lint-cleaning treatments at each batt density were replicated five times. Data represent average findings for samples tested before each replication.

TABLE 14.—*Fiber-moisture, lint foreign-matter, and cleaning efficiency data for experimental saw-cylinder lint cleanings, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Fiber-moisture content after ginning, %	Lint foreign-matter content, %		Lint-cleaner efficiency, %
Density	Weight, g/ft²			Before lint cleaning	After lint cleaning	
1	13.5	10.3	6.6	6.31	4.00	36.8
2	20.7	15.4	6.7	6.43	4.09	36.8
3	27.3	20.6	6.6	6.16	3.98	35.4
4	40.2	30.9	6.6	5.82	4.12	28.7
5	54.5	41.8	6.7	6.75	4.51	32.6
Average			6.6	6.29	4.14	34.1

[1] Lint-cleaning treatments at each batt density were replicated five times. Differences among lint-cleaner batt densities are not significant for fiber-moisture content, foreign-matter content of cleaned lint, or lint-cleaner efficiency.

TABLE 15.—*Classer's grade index and designation, and staple length of ginned lint samples before and after one stage of experimental saw-cylinder lint cleaning, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Grade index[2]		Grade designation		Staple length after cleaning,[3] 1/32-in.
Density	Weight, g/ft²		Before cleaning	After cleaning	Before cleaning	After cleaning	
1	13.5	10.3	74.4	82.9	GO+	SGO+	34.20
2	20.7	15.4	73.6	83.0	GO+	LM	34.16
3	27.3	20.6	70.6	82.5	GO	SGO+	34.12
4	40.2	30.9	75.1	82.3	SGO	SGO+	34.08
5	54.5	41.8	74.2	81.4	GO+	SGO+	34.00
Average			73.6	82.4	GO+	SGO+	34.11

[1] Lint-cleaning treatments at each batt density were replicated five times. Data represent average findings for samples tested before and after each replication. For cleaned lint, differences among lint-cleaner batt densities are not significant for grade index or staple length.

[2] Grade designation and corresponding grade index: LM=85; SGO+=81; SGO=76; GO+=73; GO=70.

[3] All samples before lint cleaning were designated 34/32 in.

TABLE 16.—*Weight and value per bale of ginned lint for one stage of experimental saw-cylinder lint cleaning, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Weight of bale, lb	Value of bale	
Density	Weight, g/ft²			Before lint cleaning	After lint cleaning
1	13.5	10.3	485.1	$78.95	$88.70
2	20.7	15.4	484.7	78.20	90.29
3	27.3	20.6	485.9	74.60	88.37
4	40.2	30.9	486.3	80.65	88.11
5	54.5	41.8	484.4	80.00	87.84
Average			485.3	78.48	88.66

[1] Weights were measured after lint cleanings and include the weight of bagging and ties; value per bale was calculated from Commodity Credit Corporation loan rates shown in appendix table 27.

Lint-cleaning treatments at each batt density were replicated 5 times. Differences among lint-cleaner batt densities are not significant for cleaned lint weight or value per bale.

TABLE 17.—*Fiber maturity data for lint processed before experimental lint cleanings, crop of 1970*

Replication[1]	Causticaire		Micronaire reading
	Maturity index, %	Fineness, μg/in	
1	79	5.0	4.7
2	79	5.1	4.8
3	78	5.1	4.7
4	78	5.0	4.6
5	79	5.1	4.7
Average ..	79	5.0	4.7

[1] Data for each replication represent average findings from the 5 lint-cleaner batt density treatments.

TABLE 18.—*Upper quartile length, mean length, and coefficient of length variation for lint samples after one stage of experimental saw-cylinder lint cleaning, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Upper quartile length, in	Mean length, in	Coefficient of variation, %
Density	Weight, g/ft²				
1	13.5	10.3	1.25	1.02	31.0
2	20.7	15.4	1.26	1.02	31.1
3	27.3	20.6	1.25	1.02	31.0
4	40.2	30.9	1.24	1.00	32.4
5	54.5	41.8	1.22	.96	34.9

[1] Lint-cleaning treatments at each batt density were replicated 5 times. Average findings for samples tested before experimental lint cleanings were: upper quartile length, 1.25 in; mean length, 1.02 in; and coefficient of variation, 30.4%.

For cleaned lint, differences among lint-cleaner batt densities are significant at the 1% level for each of the fiber-length categories shown.

TABLE 19.—*Fiber-length distribution after one stage of experimental saw-cylinder lint cleaning, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Fibers longer than 1 inch, %	Fibers 1/2 to 1 inch, %	Fibers shorter than 1/2 inch, %
Density	Weight, g/ft²				
1	13.5	10.3	62.6	27.5	9.3
2	20.7	15.4	62.4	27.6	9.4
3	27.3	20.6	62.4	27.7	9.3
4	40.2	30.9	59.3	29.3	10.9
5	54.5	41.8	54.0	32.3	13.0

[1] Lint-cleaning treatments at each batt density were replicated 5 times. Average findings for samples tested before experimental lint cleanings were: Fibers longer than 1 inch, 63.2%; fibers 1/2 to 1 inch, 27.3%; and fibers shorter than 1/2 inch, 9.1%.

For cleaned lint, differences among lint-cleaner batt densities are significant at the 1% level for each of the length groupings shown.

TABLE 20.—*Fiber strength and nep count for lint samples before and after one stage of experimental saw-cylinder lint cleaning, replicated five times, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Fiber strength,[2] g/tex		Nep count, per 100 in² of web	
Density	Weight, g/ft²		Before cleaning	After cleaning	Before cleaning	After cleaning
1	13.5	10.3	22.32	22.08	17.4	18.3
2	20.7	15.4	22.30	21.91	16.6	19.7
3	27.3	20.6	22.28	22.26	16.4	20.4
4	40.2	30.9	22.64	22.45	16.4	20.9
5	54.5	41.8	22.66	22.31	17.0	20.2
Average			22.44	22.20	16.8	19.9

[1] For cleaned lint, differences among lint-cleaner batt densities are significant at the 1% level for fiber strength and are not significant for nep count.

[2] Strength was determined by 1/8-inch gage tests using the Pressley strength tester.

TABLE 21.—*Weight and foreign-matter content of waste material extracted by one stage of experimental saw-cylinder lint cleaning, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Weight extracted per bale,[2] lb	Foreign-matter content, %
Density	Weight, g/ft²			
1	13.5	10.3	14.9	71.50
2	20.7	15.4	15.3	74.16
3	27.3	20.6	14.1	76.48
4	40.2	30.9	13.7	71.87
5	54.5	41.8	15.6	62.37
Average			14.7	71.28

[1] Lint cleaning treatments at each batt density were replicated 5 times. Differences among lint-cleaner batt densities are not significant for weight extracted per bale but are significant at the 1% level for foreign-matter content.

[2] Weight of waste is based on 478 lbs of ginned lint packaged when using no lint cleaning.

TABLE 22.—*Fiber-length distribution of waste material extracted by one stage of experimental saw-cylinder lint cleaning, crop of 1970*[1]

Lint-cleaner batt		Combing ratio	Upper quartile length, inches	Mean length, inch	Coefficient of variation, %	Fibers longer than 1 inch, %	Fibers 1/2 to 1 inch, %	Fibers shorter than 1/2 inch, %
Density	Weight, g/ft²							
1	13.5	10.3	1.19	0.92	38.4	49.5	33.0	17.0
2	20.7	15.4	1.22	.94	37.4	51.8	32.9	14.8
3	27.3	20.6	1.18	.90	39.3	47.9	32.9	18.6
4	40.2	30.9	1.18	.89	40.5	47.4	32.8	19.2
5	54.5	41.8	1.19	.91	38.4	47.5	34.6	17.4
Average			1.19	.91	38.8	48.8	33.2	17.4

[1] Lint-cleaning treatments at each batt density were replicated 5 times. Differences among lint-cleaner batt densities are not significant for any of the fiber length categories.

TABLE 23.—*U.S. Department of Agriculture Commodity Credit Corporation loan rates for warehouse-stored cotton, 1968, in cents per pound of gross bale weight*

Grade[1]	Staple length, 1/32-in	
	34	35
White:		
SLM	21.25	21.90
LM+	19.30	19.80
LM	18.75	19.25
SGO+	16.90	17.10
SGO	16.25	16.40
GO+	15.00	15.15
GO	14.45	14.55
Light Spotted:		
SLM	19.00	19.25
LM	16.65	16.75
Below grade[2]	12.65	12.70

[1] For Middling White grade and 1-inch staple length price per pound was 20.65 cents.

[2] Price was estimated by extrapolating a 1-grade reduction from Good Ordinary White.

TABLE 24.—*Results from analyses of variance for differences among the properties of lint shown after experimental lint-cleaner treatments,*[1] *crop of 1968*

Item	Significance[2]	
	Ginning rate	Lint-cleaner arrangement
Fiber moisture content[3]	NS	NS
Lint foreign-matter content	**	**
Cleaning efficiency	**	**
Grade index	NS	NS[4]
Staple length	**	**
Bale weight	**	**
Bale value	NS	NS

[1] For lint-cleaner treatments, 2 lint-cleaner arrangements were tested at 3 ginning rates. Each treatment was replicated 6 times.

[2] ** = significant at 1% level; NS = not significant except as indicated. There was no interaction between ginning rate and lint-cleaner arrangement for any of the test items.

[3] Samples were taken between the gin stand and lint cleaner.

[4] Although not significant at the 5% level, this item is significant at the 10% level.

TABLE 25.—*Results from analyses of variance for differences among fiber tests on lint samples after experimental lint-cleaner treatments,[1] crop of 1968*

Item	Significance[2]	
	Ginning rate	Lint-cleaner arrangement
Upper quartile length	NS	NS
Mean length	NS	NS
Coefficient of length variation	*	NS
Fibers longer than 1 inch	*	NS
Fibers 1/2 to 1 inch	NS[3]	NS
Fibers shorter than 1/2 inch	NS[3]	NS
Fiber strength	NS	NS
Neps per 100 in² of webb	NS	NS

[1] For lint-cleaner treatments, 2 lint-cleaner arrangements were each tested at 3 ginning rates. Each treatment was replicated 6 times.

[2] * = significant at 5-percent level; NS = not significant except as indicated. There was no interaction between ginning rate and lint-cleaner arrangement for any of the fiber tests.

[3] Although not significant at the 5% level, these items are significant at the 10% level.

TABLE 26.—*Results from analyses of variance for differences among properties of waste material extracted during experimental lint-cleaner treatments,[1] crop of 1968*

Item	Significance[2]	
	Ginning rate	Lint-cleaner arrangement
Weight per bale	**	**
Waste foreign-matter content	*	**
Upper quartile length	NS	NS
Mean length	NS	NS
Coefficient of length variation	NS	NS
Fibers longer than 1 inch	NS	NS
Fibers 1/2 to 1 inch	NS	NS
Fibers shorter than 1/2 inch	NS	NS

[1] For lint-cleaner treatments, 2 lint-cleaner arrangements were each tested at 3 ginning rates. Each treatment was replicated 6 times.

[2] ** = significant at 1% level; * = significant at the 5% level; NS = not significant. There was no interaction between ginning rate and lint-cleaner arrangement for any of the test items.

TABLE 27.—*U.S. Department of Agriculture Commodity Credit Corporation loan rates for warehouse-stored cotton, 1970, in cents per pound of gross bale weight*

Grade[1]	Staple length, 1/32-in	
	34	35
White:		
SLM	21.80	22.30
LM+	19.80	20.10
LM	19.15	19.45
SGO+	16.90	17.05
SGO	16.25	16.35
GO+	15.00	15.10
GO	14.45	14.50
Light spotted:		
SLM	19.25	19.75
LM	16.80	16.90
Below grade[2]	12.65	12.65

[1] Price per pound for Middling White grade and 1-in staple length was 20.50 cents.

[2] Price was estimated by extrapolating a 1-grade reduction from Good Ordinary White.

TABLE 28.—*Results from analyses of variance for differences among the properties of lint shown after experimental lint-cleaner treatments,[1] crop of 1970*

[Items are attributed to lint-cleaner batt density at significance level shown]

Not significant	Significant, 1-percent level
Fiber moisture content[2]	Upper quartile length
Lint foreign-matter content	Mean length
Cleaning efficiency	Coefficient of length variation
Grade index	Fibers longer than 1 inch
Staple length	Fibers 1/2 to 1 inch
Bale weight	Fibers shorter than 1/2 inch
Bale value	
Neps per 100 in² of web	Fiber strength

[1] For lint-cleaner treatments, 5 lint batt densities were tested, each at a different combing ratio. Cleaning treatments were replicated 5 times.

[2] Samples were taken after ginning but before lint cleaning.

TABLE 29.—*Significant differences for fiber properties of lint samples after lint cleaning with five experimental batt densities,*[1] *crop of 1970*

Fiber property and significance level	Lint batt weight, g/ft²				
	13.5	20.7	27.3	40.2	54.5
Upper quartile length, in:					
1 percent	1.25a	1.26a	1.25a	1.24ab	1.22b
5 percent	1.25a	1.26a	1.25a	1.24ab	1.22b
Mean length, in:					
1 percent	1.02a	1.02a	1.02a	1.00a	.96b
5 percent	1.02a	1.02a	1.02a	1.00a	.96b
Coefficient of length variation, %:					
1 percent	31.0a	31.1a	31.0a	32.4a	34.9b
5 percent	31.0a	31.1a	31.0a	32.4a	34.9b
Fibers longer than 1 inch, %:					
1 percent	62.6a	62.4a	62.4a	59.3a	54.0b
5 percent	62.6a	62.4a	62.4a	59.3a	54.0b
Fibers 1/2 to 1 inch, %:					
1 percent	27.5a	27.6a	27.7a	29.3ab	32.3b
5 percent	27.5a	27.6a	27.7a	29.3a	32.3b
Fibers shorter than 1/2 inch, %:					
1 percent	9.3a	9.4a	9.3a	10.9a	13.0b
5 percent	9.3a	9.4ab	9.3a	10.9b	13.0c
Fiber strength, g/tex:					
1 percent	22.08ab	21.91a	22.26ab	22.45b	22.31ab
5 percent	22.08ab	21.91a	22.26bc	22.45c	22.31bc

[1] Numbers in the same row not having a letter in common are significantly different at the level indicated.

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